deemable after a few years, if the Society shall prefer, but he would prefer a few thousand dollars to be paid on account. We propose to offer $15,000; but consider that the Society should not miss the lot if satisfied with the location.

"The lot is the most central of any we know of, having the dimensions we require, with a front towards the southwest corner of Penn Square; and if this opportunity be lost, it is believed no vacant lot so suitable for our purpose can be had.

"The dimensions of the lot are 74 feet front, by 92 feet in depth, to a small street.

"We recommend that the Society make the purchase."

(Signed) ELI K. PRICE,
STEPHEN COLWELL,
F. FRALEY.

Dated October 3d, 1864.

To bring the matter before the meeting, Mr. Fraley moved that the Committee be authorized, at their discretion, to purchase the lot of Mr. Harrison, for a sum not greater than $16,000, and to make immediate payment of a portion, not exceeding $5,000.

After some discussion, on motion of Judge Sharswood, the consideration of the subject was postponed until the first stated meeting in November next.

And the Society was adjourned.

Stated Meeting, October 21, 1864.

Present, eight members.

Dr. BELL in the Chair.

A letter accepting membership was received from Dr. A. Tholuck, dated Halle, October 4th, 1864.

A letter of acknowledgment was received from the Chicago Historical Society, dated October 8th, 1864.

Donations for the Library were received from the Bureau of Public Instruction and Public Works, at Paris; the New England Loyal Publication Society; Messrs. Blanchard & Lea, and Bishop Stevens.

The death of Dr. William Pepper, a member of the Society, was announced by Dr. Coates. Dr. Pepper died on the 15th inst., aged 54. Dr. Coates was appointed to prepare an obituary notice of the deceased.

Mr. Chase made a communication on Terrestrial Magnetism as a Mechanical agent.

In a note to a former communication, I expressed my belief that the British Astronomer Royal would find in the mechanical action of the sun's rays, the precise "occasional currents" for which he was seeking, as the probable cause of magnetic storms. Mr. Airy has recently sent me a copy of his very interesting paper, (Trans. Roy. Soc., 1863, Art. XXIX.), and its perusal has greatly strengthened this belief.

All of my meteorological views rest upon the hypothesis, that the atmospheric changes, whether of humidity, temperature, pressure, electricity, or magnetism, are purely mechanical; and that being controlled by the laws of motion, their proper explanation does not require the assumption of any peculiar magnetic or electric fluid, but that a single homogeneous, elastic, and all-pervading æther, may be both the source and the receptacle of all the various forms of force. In its principal features, this theory harmonizes with the now generally accepted belief in the mechanical origin of light and heat, but in its details it involves some new and interesting special applications, which I have endeavored partially to develop.

It will be readily seen, by a reference to my communication of April 15, (*ante*, p. 367, sqq.), that the *mechanical* action of the currents to whose *electric* action Ampère ascribed the origin of terrestrial magnetism, produces two opposite spirals in the air and æther,—the lower moving from the poles to the equator, and against the earth's rotation; the upper from the equator to the poles, and in the same direction as the earth's rotation; the two being connected by innumerable currents of convection, or threads of ascending and descending particles. It will also be evident that at every place there are two principal sets of such double spirals, one with an axis perpendicular to the earth's radius vector, producing a maximum disturbance in the early afternoon, and the other more stable and uniform, with an axis passing through the nearest poles of greatest cold. In addition to the mutual perturbations of these two principal polarizing currents, the rolling of the luni-tidal attraction-wave produces at every instant a greater or less derangement,* and I find that the ratio of the lunar-barometric to the lunar-magnetic disturbance (4.384), is nearly identical with Mr. Welsh's determination of the moment of magnetic inertia (4.4696; Phil. Trans., v. 153, p. 297). From a variety of considerations, it appears that the mechanical polarity or magnetic force thus engendered, is a third proportional to two other forces, which may be called, respectively, central and tangential.

The communication which was presented at our last meeting, in its exhibition of the first numerical relationship that has ever been pointed out between the barometric and magnetic fluctuations, showed that A : B : : B : M, a proportion in which A represents a central, B a tangential, and M a magnetic force.

I find a similar proportionality in each of Mr. Airy's summary tables (Op. citat., p. 627, sqq). Thus in his "Table II, Algebraic Sums of Magnetic Fluctuations (in terms of Horizontal Force) for each Year, from 1841 to 1857, including all Days of Record of Great Magnetical Disturbance," the Mean Disturbance is

Westerly Force.	Northerly Force.	Nadir Force.
—.00023=M.	—.00146=T.	—.00057=C.

Here the proportion T : C : : C : M gives for M a

Theoretical value, ...	—.000222
Observed "	—.000228
Probable error, ...	.000080

"Table III. Algebraic Sums of Magnetic Fluctuations (in terms of Horizontal Force) for each Year, from 1841 to 1857, including

* Besides the great disturbing agencies, whose effects may perhaps be determinable by mathematical prediction, every transient local accumulation of heat or cold will exert an influence. Everything that can produce currents or eddies in the atmosphere, may also be presumed to affect the æther, and the inconceivable rapidity of the æthereal motions, as manifested in the velocity of the waves of light and heat, will account for the extreme sensitiveness of the magnetic needle

only those Days of Great Magnetic Disturbance, in which Records were made by the three Instruments."

Theoretical value of M, ...	—.000287
Observed " "	—.000257
Probable error, ...	.000068

Tables V and VI, exhibit an approximation to the proportion, C : T : : T : M, but the approximation does not come within the limits of probable error. As no attention is paid in these two Tables to the positive and negative signs, we could not reasonably expect so satisfactory results as in Tables II and III.

"Table VIII. Sums, without regard of sign, of Coefficients of Magnetic Irregularity (in terms of Horizontal Force) for each Year, from 1841 to 1857, including all Days of Record of Great Magnetical Disturbance." The proportion C : T : : T : M, gives for M a

Theoretical value, ...	.001218
Observed "	.001203
Probable error, ...	.000066

"Table IX. Sums, without regard of sign, of Coefficients of Magnetic Irregularity (in terms of Horizontal Force) for each Year, from 1841 to 1857, including only those Days of Great Magnetic Disturbance, in which Records were made by the three Instruments."

Theoretical value of M, ...	.001137
Observed " "	.001150
Probable error, ...	.000081

In addition to these numerical coincidences, the following points in Mr. Airy's paper appear to me to be specially noteworthy.

1. "The Aggregate for the Westerly Force . . . . (taken in comparison with that for the Northerly Force), appears to show that on the whole, the direction of the Disturbing Force is 10° to the east of south;" p. 628. This indicates a line of mean disturbance about midway between the magnetic meridian (which, at London, is about N. 24° W.), and the solar meridian, or midway between the meridians of decussation in the two sets of principal spirals, to which I have referred.

2. "Sometimes two waves in one direction correspond nearly with one in the other direction. . . . . A more frequent relation appears to be, that the evanescence of one wave corresponds with the maximum of the other;" p. 635.

3. "The most striking particulars in the last line (of Tables VIII and IX) are the following:

"First, the almost exact equality of the Mean Coefficients of Irregularity in the three elements. . . . . With reference to their physical import, I think it likely that the equality of Coefficients of Irregularity may hereafter prove to be one of the most important of the facts of observation.*

"Second, the near agreement in the number of Irregularities for Westerly Force and for Northerly Force.

"Third, the near agreement in the number of Irregularities for Nadir Force with half the number of Irregularities for Westerly or for Northerly Force;" p. 641–2.

4. Tables X and XI (p. 643–4) show that the disturbances are greatest in the winter months and in the night hours. Table X, also appears to indicate minima of fluctuations and inequalities in months when there is the greatest uniformity of temperature, and maxima when the changes of temperature are greatest and most frequent.

5. Tables XI and XII furnish the materials for the following synopsis:

Forces.		Sums of Wave disturbance. +	Sums of Wave disturbance. —	Sums of Irregularities.	Mn Wave disturbances.	Average departure from Mean ±	Mean Irregularity ±	Frequency of Storms.
Westerly Force.	Time of max. . . .	20 h	10 h	10 h	20 h	13 h	15 h	9 h
	Time of min. . . .	10 h	21 h	23 h	10 h	2 h	1 h	23 h
	Amt. of max. . . .	.1170	.2191	.1976	+ .00142	.00104	.00162	126
	Amt. of min. . . .	.0165	.0083	.0346	— .00165	.00056	.00074	51
Northerly Force.	Time of max. . . .	5 h	12 h	8 h	5 h	20 h	15 h	8 h
	Time of min. . . .	22 h	1 h	23 h	22 h	1–2 h	23 h	23–1 h
	Amt. of max. . . .	.1407	.2917	.1754	+ .00038	.00168	.00144	136
	Amt. of min. . . .	.0038	.0674	.0441	— .00319	.00093	.00077	57
Nadir Force.	Time of max. . . .	7 h	14 h	10 h	0 h	3 h	0 h	10 h
	Time of min. . . .	22 h	1 h	23 h	17 h	22 h	23 h	1 h
	Amt. of max. . . .	.3976	.3133	.1241	+ .00570	.00363	.00180	86
	Amt. of min. . . .	.0355	.0306	.0177	— .00380	.00157	.00074	19

"The Soli-tidal character of the principal characteristics of the occasional Magnetic Storms, as to frequency, magnitude, inequalities wave-disturbance, and Irregularities, is seen clearly in this Table." (Table XII) p. 645. There are subordinate maxima and minima, the consideration of which will become interesting, when the laws of the principals have been well ascertained and defined.

6. "In regard to the Wave-disturbance: for Westerly Force, the aggregate is + from 17 h. to 6 h., — from 7 h. to 16 h.; for Northerly

* This approach to equality appears to be still more important, in view of the proportionality—C : T : : T : M.—P. E. C.

Force, the aggregate is + from 3 h. to 5 h., — from 6 h. to 2 h.; and for Nadir Force, the aggregate is + from 23 h. to 10 h., — from 11 h. to 22 h.;" p. 644.

7. Mr. Airy presents some conclusive considerations, "showing that the observed disturbances cannot be produced by the forces of any suddenly created galvanic current or polar magnet," and remarks as follows, respecting his theory: "Its fundamental idea is, that there may be in proximity to the earth something which (to avoid unnecessary words) I shall call a Magnetic Ether; that under circumstances generally, but not always, having reference to the solar hour, and therefore, probably, depending on the sun's radiation or on its suppression, a current from N.N.W. to S.S.E., approximately, or from S.S.E. to N.N.W. (according to the boreal or austral nature of the ether), is formed in this Ether; that this current is liable to interruptions or perversions of the same kind as those which we are able to observe in currents of air and water; and that their effect is generally similar, producing eddies and whirls, of violence sometimes far exceeding that of the general current from which they are derived;" p. 646.

8. "And in the relation between E. and W. disturbances and vertical disturbances, there is a point which well deserves attention. When a water-funnel passed nearly over the observer, travelling (suppose) in a N. direction, he would first experience a strong current to the E., afterwards a strong current to the W (or *vice versa*), and between these there would be a very strong vertical pressure in one direction, not accompanied by one in the opposite direction; thus he would have half as many vertical as horizontal impulses. This state of things corresponds to the proportion which we have found throughout for the magnetic disturbances, and to the relation found in Article 18. I may also add that the rule at which we have arrived, that the waves of vertical force are few, but that their power, when they do occur, is very great, seems to correspond to what is reported of the whirlwinds of great atmospheric storms; which, violent and even frequent as they may be, occur very rarely at any assigned place;" p. 647.

I add a few considerations from Maj. Gen. Sabine's discussions. (Phil. Trans., Vol. 153, Art. XII.)

9. "The westerly deflections at Kew . . . have a decided double maximum, with an intervening interval of about eight or nine hours. . . . The conical form and single maximum which characterizes the *easterly* deflections at Kew, belong also to the easterly deflections in

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all localities in North America, where the laws of the disturbances have been investigated. But . . . at Nertschinsk and Pekin . . . the conical form and single maximum characterize the *westerly* deflections, whilst the easterly have the double maximum. . . . At the two Asiatic stations, the aggregate values of the *westerly* deflections decidedly predominate, whilst in America the *easterly* deflections are no less decidedly predominant; and at Kew, . . . the amount of deflection in the two directions may be said to be balanced;" p. 282.

10. The differences of the weekly from the annual means of declination, indicate "with a very high degree of probability, an *annual variation*, whereby the north end of the magnet points more towards the east when the sun is north, and towards the west when the sun is south of the equator;" p. 291.

11. The residual errors in the monthly determinations of the Horizontal Force and of the Dip, "are thoroughly confirmatory of a semi-annual inequality, having its epochs coincident, or nearly so, with the sun's passage of the equator;" p. 303.

12. There appears to be "an increase of the Dip and of the Total Force, and a deflection of the north end of the Declination magnet towards the West, in both hemispheres, in the months from October to March, as compared with those from April to September. . . . The greater proximity of the earth to the sun in the December compared with the June Solstice most naturally presents itself as a not improbable cause; but we are as yet too little acquainted with the mode of the sun's action on the magnetism of the earth, to enter more deeply into the question at present;" p. 307.

I have neither the leisure nor the ability to undertake an exhaustive analysis of the results thus brought together; but I present them as well worthy of a profound mathematical investigation, as confirmatory in very striking and minute particulars of my mechanical hypotheses, and as furnishing new and strong presumptive evidence of that marvellous simplicity of force to which many independent branches of modern physical research so strongly point. This evidence is strengthened by the existence, as I have shown elsewhere, of the tidal law of sines in the solar-diurnal variation of the magnetic needle, by the magnetic effect of the daily barometric rotation-tide, as exhibited in the convergence of lines of equal barometric disturbance towards the hours of high barometer and their divergence from the hours of low barometer, by many points of resemblance between the daily and yearly variation-curves, both of temperature and of magnetism, and by certain considerations confirmatory of the reasonable presumption that there may be lunar-monthly magnetic tides, somewhat analogous to those which I have pointed out in the barometer. (Proceedings of the Roy. Soc., June 16, and Am. Phil. Soc., June 17, 1864.)

Besides the differential or tidal action of the moon, there is a slight tendency to diminish the weight of the air that is nearest the moon, and to increase the weight of that which is most remote. In proportion as this tendency is exerted in conjunction with or in opposition to that of the sun, the mean solar-diurnal magnetic currents should be increased or diminished. Slight as the disturbing influence is, and modified as it must be by various causes, both occasional and periodic (*e. g.* the earth's rotation, the cyclical revolution and consequent varying latitude of the moon at the commencement of each new month, the oscillations in the aerial rotation-spheroid produced by lunar attraction, the changes in the average temperature of day

TABLE I.

*Solar and Lunar Daily Magnetic Tides, in parts of Force.**

Solar and Lunar Hours.	Horizontal Force.		Vertical Force.		Total Force.	
	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.
	.00	.000	.000	.000	.000	.000
0	+1099	+006	—022	—005	+95	+005
1	+0911	—003	+229	+027	+82	—001
2	+0623	—011	+446	+031	+60	—005
3	+0368	—014	+593	+044	+40	—006
4	+0133	—020	+638	+072	+20	—007
5	—0080	—014	+608	+041	+01	—006
6	—0270	—007	+611	+050	—15	+001
7	—0394	—004	+545	+028	—26	+001
8	—0465	000	+300	—012	—36	—002
9	—0511	+022	+219	—011	—41	+018
10	—0530	+032	+074	—017	—45	+025
11	—0522	+031	—011	—037	—45	+022
12	—0481	+019	—100	—003	—43	+016
13	—0449	+017	—165	+005	—41	+015
14	—0405	+013	—224	+019	—38	+014
15	—0376	—009	—289	+048	—36	—001
16	—0352	—011	—345	+051	—35	—002
17	—0329	—008	—398	+029	—34	—003
18	—0298	—009	—465	+013	—32	—006
19	—0154	—004	—513	—011	—20	—005
20	+0130	+003	—582	—053	+03	—005
21	+0470	+006	—491	—050	+34	—002
22	+0803	+013	—427	—054	+63	+004
23	+1019	+009	—214	—067	+85	—001

* The first decimal figures are placed, for convenience, in an upper line.

and night at different seasons and in different years, &c.), it may yet, perhaps, be discernible in comparing the results of a long series of careful and delicate observations. The accompanying tables are deduced from such a comparison of the St. Helena records.

Table I is compiled from Maj. Gen. Sabine's Tables 36, 37, 50, 51, 52, 53 (St. Helena Observations, Vol. II). It is specially interesting as showing the influence of the opposition of attraction to rotation in producing low solar tides at 10 or 11 P. M., the prompt and direct influence of the sun upon the æthereal currents in the production of a high tide at noon, the double maxima and minima in each of the lunar tides, the additional confirmation of the analogies that I have heretofore pointed out between the spheroids of attraction and rotation, the opposition of the solar and the resemblance of

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TABLE II.

Lunar-Monthly Magnetic Tide of Horizontal Force.

Moon's Position. °	Mean Daily Fluctuations of Horizontal Force at St. Helena.*			
	1844.	1845.	1846.	1844–6. Average.
0	61.31	53.75	40.88	51.98
15	61.66	53.29	41.24	52.06
30	62 20	52.85	41.73	52.26
45	62.32	53.61	41.81	52.58
60	62.56	52.40	40.66	51.87
75	62 76	52 36	41.34	52.15
90	61.82	52.80	41.54	52.05
105	61.37	53.11	40.42	51.63
120	60.47	53.43	39.97	51.29
135	59.42	53.60	40.46	51.16
150	60 23	53.01	40 14	51.13
165	60.54	53.46	39.72	51.24
180	58.81	53.91	40.86	51.19
195	59.39	53.64	40.27	51.10
210	59.35	53.57	40.70	51.20
225	58.88	52.91	40.74	50.85
240	59.66	52 80	39.79	50.75
255	60.35	52.92	40.70	51.32
270	60.50	53.43	40.65	51.51
285	60.89	53 81	41.10	51.94
300	61.64	52.82	41.41	51.96
315	61.80	53.10	41.34	52 08
330	62.14	53.45	42 39	52.66
345	62.16	52.97	41.85	52.32

* The value of one scale division is .00019 of the Horizontal Force, in 1844 and 1845, and .00021 in 1846.

the lunar zenith and nadir effects, and the evidence in the partial "establishment" of the moon's tides that most of her magnetic influence is exerted indirectly on the æther, through the intervention of atmospheric attraction-currents.

Tables II and III were formed by taking the mean of the hourly averages, on the twenty-four days in each lunar month which are most nearly indicated by the angular positions given in the first column. Each of the tabular numbers for 1844 and 1845 represents the average of two hundred and eighty-eight hourly observations; each of the numbers for 1846, the average of two hundred and sixty-four observations, with a few exceptions of holidays and other omitted days, for which the missing numbers were interpolated. Table II indicates a tendency to mean lunar influence between 90° and

TABLE III.

Lunar-Monthly Magnetic Tide of Vertical Force.

Moon's Position. °	Mean Daily Fluctuations of Vertical Force at St. Helena.*			
	1844.	1845.	1846.	1844–6. Average.
0	48.42	48.51	43 56	46.83
15	48.21	48 55	43.90	46.89
30	47.33	48.53	44.55	46.80
45	47 33	48.25	43 96	46 51
60	47.45	48.47	43.69	46.54
75	47.62	47.88	44.22	46.57
90	47.65	47.43	44.77	46.62
105	47.62	46.92	45.31	46.62
120	47.53	47.42	45.65	46.87
135	47.76	47.40	47.30	47.49
150	47.55	47.50	47.23	47.43
165	47.52	47.70	47.02	47.41
180	47 06	47.77	46.54	47.12
195	47.96	48.02	46.29	47.42
210	48.14	48.26	45.88	47.43
225	47.49	48.26	46.39	47.38
240	48.40	48.60	45.32	47.44
255	48.16	48.52	44.64	47.11
270	48.00	48 08	44.54	46.87
285	47.93	47.70	44.61	46.75
300	48.06	48.26	44.91	47.08
315	48.17	48.56	44.95	47.23
330	48.49	47.91	43.78	46.73
345	48.18	47.44	43.99	46.54

* The value of one scale division varies from .00051 to .00091 of the Vertical Force.

105°, and between 270° and 285°, the influence increasing when the moon acts either in conjunction with the sun, or directly upon condensed air and *vice versâ*. It also shows the existence of disturbances, which may be accounted for by some of the causes to which I have already referred. Table III exhibits apparent tendencies to diminution of force near the syzygies, and to increase of force a day or two after the quadratures.

Table IV is a compendium of the tidal differences in the two preceding tables. It shows the effect of temperature in producing maxima and minima when the coolest and warmest portions of the earth are submitted to the direct action of the moon (at or near 240° and 45°), low temperature producing a minimum of horizontal force, with a maximum of vertical force, and *vice versâ*. From the variations of horizontal force $\left(\frac{\Delta X}{X}\right)$ and vertical force $\left(\frac{\Delta Y}{Y}\right)$ given in this table, Table V is formed, the mean variations of total force $\left(\frac{\Delta \varphi}{\varphi}\right)$ being

TABLE IV.

Lunar-Monthly Magnetic Tide. Differences from Monthly Means.

Moon's Position. °	Horizontal Force.			Vertical Force.			Means	
	1844.	1845.	1846.	1844.	1845.	1846.	H. F.	V. F.
0	+ .38	+.54	— .02	+.59	+ .51	—1.56	+.30	—.16
15	+ .73	+.08	+ .34	+.38	+ .55	—1.22	+.38	—.10
30	+1.27	—.36	+ .83	—.50	+ .53	— .57	+.58	—.19
45	+1.39	+.40	+ .91	—.50	+ .25	—1.16	+.90	—.48
60	+1.63	—.81	— .24	—.38	+ .47	—1.43	+.19	—.45
75	+1.83	—.85	+ .44	—.21	— .12	— .90	+.47	—.42
90	+ .89	—.41	+ .64	—.18	— .57	— .35	+.37	—.37
105	+ .44	—.10	— .48	—.21	—1.08	+ .19	—.05	—.37
120	— .46	+.22	— .93	—.30	— .58	+ .53	—.39	—.12
135	—1.51	+.39	— .44	—.07	— .60	+2.18	—.52	+.50
150	— .70	—.20	— .76	—.28	— .50	+2.11	—.55	+.44
165	— .39	+.25	—1.18	—.31	— .30	+1.90	—.44	+.42
180	—2.12	+.70	— .04	—.77	— .23	+1.42	—.49	+.13
195	—1.54	+.43	— .63	+.13	+ .02	+1.17	—.58	+.43
210	—1.58	+.36	— .20	+.31	+ .26	+ .76	—.48	+.44
225	—2.05	—.30	— .16	—.34	+ .26	+1.27	—.83	+.39
240	—1.27	—.41	—1.11	+.57	+ .60	+ .20	—.93	+.45
255	— .58	—.29	— .20	+.33	+ .52	— .48	—.36	+.12
270	— .43	+.22	— .25	+.17	+ .08	— .58	—.17	—.12
285	— .04	+.60	+ .20	+.10	— .30	— .51	+.26	—.24
300	+ .71	—.39	+ .51	+.23	+ .26	— .21	+.28	+.09
315	+ .87	—.11	+ .44	+.34	+ .56	— .17	+.40	+.24
330	+1.21	+.24	+1.49	+.66	— .09	—1.34	+.98	—.26
345	+1.23	—.24	+ .95	+.35	— .56	—1.13	+.64	—.45

obtained by the formula $\frac{\Delta\varphi}{\varphi} = \cos^2\theta \frac{\Delta X}{X} + \sin^2\theta \frac{\Delta Y}{Y}$. I have taken $\theta = -22°$; one scale division of horizontal force = .000194; one division of vertical force = .000792; which are almost identical with the values employed by Gen. Sabine in the computation of his Tables of hourly variation in solar and lunar total force.

In a similar manner I have computed Table VI, showing the average hourly variations, both in solar and lunar total force, in each of the three years which have furnished the data for most of my deductions. The first decimal figures are placed in an upper line, as in Table I. Perhaps the principal utility of this table may be found in some future extension of these investigations, but even now it is interesting, inasmuch as it exhibits the probable influence of periodic causes in shifting the hours of the daily maxima and minima, and as it lends added weight to the preceding tables, by showing that the monthly tide is more regular than the daily tide.

TABLE V.

Lunar-Monthly Magnetic Tide of Total Force.

Moon's Position.	Mean Daily Fluctuations at St. Helena, in parts of Total Force.			
°	1844.	1845.	1846.	1844–46. Average.
0	+.00013	+.00015	—.00018	+.00003
15	+.00017	+.00007	—.00008	+.00005
30	+.00016	.00000	+.00007	+.00008
45	+.00018	+.00009	+.00002	+.00010
60	+.00023	—.00008	—.00020	—.00002
75	+.00028	—.00015	—.00003	+.00003
90	+.00013	—.00013	+.00007	+.00002
105	+.00005	—.00014	—.00006	—.00005
120	—.00011	—.00003	—.00010	—.00008
135	—.00026	.00000	+.00017	—.00003
150	—.00015	—.00009	+.00011	—.00004
165	—.00010	+.00001	+.00001	—.00003
180	—.00044	+.00009	+.00015	—.00007
195	—.00024	+.00007	+.00003	—.00005
210	—.00023	+.00009	+.00005	—.00003
225	—.00038	—.00002	+.00012	—.00009
240	—.00015	.00000	—.00016	—.00010
255	—.00006	+.00001	—.00009	—.00005
270	—.00005	+.00005	—.00011	—.00004
285	.00000	+.00007	—.00002	+.00002
300	+.00014	—.00004	+.00006	+.00006
315	+.00018	+.00004	+.00005	+.00009
330	+.00027	+.00003	+.00010	+.00013
345	+.00024	—.00010	+.00003	+.00006

It seems not improbable that the mutual planetary perturbations which are sufficiently powerful to affect their orbital revolution, may also exert an appreciable influence on their æthereal spheroids, and that numerous cyclical magnetic variations may be thus produced. The disturbance of Jupiter is by far more important than that of any other planet, its mean attractive energy being nearly a third proportional to those of the sun and moon.* The annual fluctuations are very great, the intensity being about $\frac{1}{114}$ when Jupiter is nearest the earth, and less than half as great, or only about $\frac{1}{247}$, when most remote. The combined operation of the tropical revolutions of Jupiter, the moon's apsides, and the moon's nodes, should produce a series of disturbances corresponding very nearly in duration with

TABLE VI.

Solar and Lunar-Daily Tides of Total Force.

Solar and Lunar Hours	1844.		1845.		1846.	
	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.
	.000.	.000.	.000.	.000.	.00.	.000.
0	+83	+009	+88	—009	+066	+004
1	+83	+011	+97	—014	+104	+015
2	+67	—005	+85	—016	+097	—004
3	+49	—004	+63	—008	+076	+018
4	+28	—024	+41	—012	+054	+017
5	+15	—032	+20	—001	+031	+024
6	+02	—027	+02	+002	+008	+028
7	—11	—016	—11	+010	—014	+022
8	—22	—006	—24	+003	—026	+022
9	—31	+001	—35	+034	—036	+022
10	—35	+008	—39	+041	—043	+024
11	—37	+029	—46	+031	—047	+021
12	—37	+017	—48	+021	—053	+008
13	—38	+021	—43	+012	—048	+011
14	—39	+045	—44	+012	—040	—001
15	—32	+021	—42	+006	—038	—029
16	—30	+061	—39	+006	—043	—033
17	—29	—004	—39	+006	—041	—027
18	—22	—012	—37	—008	—042	—020
19	—24	—006	—36	—016	—041	—019
20	—16	—014	—24	—008	—027	—011
21	+07	+017	+03	—006	—008	—021
22	+38	+022	+32	—002	+029	—008
23	+64	+016	+63	—009	+063	—010

* If we take as our unit the moon's attraction for the earth $\frac{M}{D^2}$, he sun's will be about 177, and Jupiter's $\frac{1}{174}$.